DOCUMENT RESUME

ED 113 556 CE 005 104

TITLE	The Delineation of Economic and Health Service Areas and the Location of Health Manpower Education Programs--A Summary.
INSTITUTION	Health Resources Administration (DHEW/PHS), Bethesda, Md. Div. of Manpower Intelligence.
PUB DATE	Feb 74
NOTE	35p.; Summary of ED 094 219
EDRS PRICE	MF-$0.76 HC-$1.95 Plus Postage
DESCRIPTORS	Bibliographies; Cooperative Planning; *Delivery Systems; Economic Factors; *Economic Research; *Educational Programs; Health Occupations Education; *Health Services; Manpower Needs; Manpower Utilization; *Regional Planning; Regional Programs
IDENTIFIERS	*Health Delivery Systems

ABSTRACT

The document's research concerns are directed to the study of various dimensions of health care delivery systems and the dynamics of health manpower supply and requirements. It attempts to explore and determine the effectiveness of the economic system as a surrogate in health planning for the health care delivery system, and to estimate the interrelationships of the health manpower education systems with the economic system and the health care delivery system. The overall objectives of the project were to determine the applicability of regional economic theory in this framework, thus lending further insights into the process of locational decision-making, and developing a useful tool and perspective for the health planner. The document represents a summary of the major activities, findings, and conclusions identified in the final report of the research. It describes the major hypotheses and findings, and policy implications of the study. A 12-page bibliography is given under the topics of economics and health. (Author/EC)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED113556

THE DELINEATION OF ECONOMIC AND HEALTH SERVICE AREAS AND THE LOCATION OF HEALTH MANPOWER EDUCATION PROGRAMS

--A SUMMARY--

Summary from Final Report of Contract No. NIH 72-4083

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CE 005 104

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service Health Resources Administration
Bureau of Health Resources Development
Division of Manpower Intelligence
February 1974

2/3

FORWORD

In recent years, economists and operation researchers have devoted considerable effort to the study of various dimensions of the health care delivery system and of the dynamics of health manpower supply and requirements. As such, a number of key aspects of economic theory--including the use of econometric models and concepts such as economies of scale, internal rate of return, and income and price elasticities--have become more prevalent in the health literature.

Concurrent with this development, and proceeding somewhat independently, has been a marked expansion in studies and articles concerned with specialty and geographic imbalances of health services and manpower. These developments apparently reflect a recognition that aggregate, national profiles of health dynamics provide only partial insights into understanding and groping with problems of equity and distribution.

Since its inception in 1970, the Division of Manpower Intelligence (DMI) of the Bureau of Health Resources Development has been vitally interested and actively engaged in analysis of both of these areas. As part of its extramural program, consequently, a number of major analytical efforts have been undertaken that attempt to examine empirically current and future dimensions of the health care delivery system and health manpower.

In line with these program objectives, in 1972 DMI commissioned the Division of Business and Economic Research, College of Commerce and Industry, The University of Wyoming, to undertake a research effort concerning the use of economic theory in health locational decision-making. Specifically, the first part of this effort was to explore and determine whether the economic system could effectively be used as a surrogate in health planning for the health-care delivery system. The

second aspect of this research endeavor was to estimate the interrelationships of the health manpower education system with the economic system and the health-care delivery system. The overall objectives of the project were to determine the applicability of regional economic theory in this framework, hopefully to lend further insights into the process of locational decision making, and to develop a useful tool and perspective for the health planner.

From the viewpoint of social science research, the results of this study effort represent important, initial steps in the empirical process. In this regard, a number of research areas are proposed within the study to further validate hypotheses presented and to test the transferability of the study results to other settings. From the viewpoint of practitioners of health manpower planning, at the same time, the study provides useful insights and perspectives. Challenge is given in the study, for example, to the traditional usage of practitioner/population ratios, while a rationale is provided for concentrating on communities and economic trade areas for planning purposes rather than using political-geographic jurisdictions.

This publication represents a summary of the major activities, findings, and conclusions identified in the final report of the contracted research. The abstract, largely excerpted from the final report, was prepared to permit a wider distribution of the results obtained. The bibliography presented in the final report--both economic and health--has also been included in this summary presentation.

John M. Leyes, Ph.D., currently with the Virginia State Council of Higher Education, was the primary author and project director for this research effort. During the course of the actual research work and the preparation of the final report, Dr. Leyes was Assistant Professor of Economics at the University of Wyoming. Other authors on the staff of Dr. Leyes included J. Stuart Miller, Joyce Lofgren, Jeffrey White, and Sara Goetz. Paul M. Schwab, of the Division of Manpower Intelligence, BHRD, HRA, was project officer for this extramural activity.

Copies of the final report of this study, entitled The Delineation of Economic and Health Service Areas and the Location of Health Manpower Education Programs, can be obtained by directing requests to the Information Office, Bureau of Health Resources Development, Health Resources Administration, National Institutes of Health, Bethesda, Maryland.

W A Lybrand

William A. Lybrand, Ph.D.
Director
Division of Manpower Intelligence

The Delineation of Economic and Health Service Areas and the Location of Health Manpower Education Programs--A Summary

Traditionally, research efforts concerned with examining the dynamics of the health-care delivery system have focused on this system as a separate entity independent of the economic system. In fact, however, the provision of sets of health-care services to various population segments is quite similar to the provision of respective sets of economic services to consumers. It would seem reasonable, therefore, to expect that detailed information about the economic system in a particular geographic area would be most helpful in studying the health-care delivery system for that area.

In addition, data on the characteristics and interactions within the health system, particular on an area basis, are often not collected regularly and uniformly, with the result that each study of the health system requires some survey activities. If the economic and the health systems are closely related, however, and given the generally more complete data on the former, then greater is the probability that the economic system can be used as a surrogate for the health-care delivery system.

In the University of Wyoming study, entitled The Delineation of Economic and Health Service Areas and the Location of Health Manpower Education Programs, preliminary attempts were undertaken to demonstrate this identity relationship, namely to use the regional economist's central place theory to compare the economic system and the health care system within a specific geographic setting.[1/] Coincident with this effort were additional research activities designed to estimate the interrelationships of the health manpower education system with the respective economic and

---

1/ The State of Wyoming was initially chosen as the study area. Because the subject to be studied was economic and health services purchases of Wyoming residents, those counties immediately adjacent to Wyoming were included plus those additional counties in the surrounding States that contain major central places (i.e. Denver, Colorado; Billings, Montana; Salt Lake City, Utah; Provo, Utah; Idaho Falls, Idaho; and Rapid City, South Dakota).

health-care delivery systems. The following summary highlights the methodology applied by the authors to accomplish this undertaking, the major hypotheses tested and subsequent findings, as well as key conclusions and policy implications uncovered by the effort.

Methodology and Rationale

In brief, central place theory relates the spatial results of supply and demand decisions.[2/] That is, when a commodity or service is presented for sale, a consumer's buying decision involves his consideration of the price, quality, and related transportation costs. The formal concept of central place theory has been attributed to two German scholars--Christaller, a geographer, and Losch, an economist--whose original works were published in 1933 and 1941, respectively.[3/] The rigorious assumptions postulated in the formal theory, however, result in an economic model considerably removed from reality. As such, numerous investigators have added mofifications to the theory which attempt to give the theory and resulting models greater applicability to "real world" conditions and greater ease of being determined and tested empirically.

The specific part of central place theory applied in the Wyoming study was that of hierarchical demand structures. The latter is based on the notion that the amount and frequency of goods and services purchased by consumers, including health services in this instance, varies according to the type of goods and services. Groceries are purchased with more frequency and regularity than clothing, which

---

2/ Chapter II of the Wyoming study, entitled "Literature Review," provides a detailed description of central place theory, as well as a review of the methodologies traditionally employed in empirical studies applying central place theory.

3/ Generalized descriptions of the Christaller-Losch model can be found in many works. As referenced in the economic bibliography appended to this summary, see, for example, Richardson, 1969, pages 105-8 and 156-65; Berry, 1967c, Chapter 2; Nourse, 1968, Chapter 3; and Marshall, 1969, Chapter 2.

is purchased more frequently than hospital services, which, in turn, are purchased more frequently than nursing home services. On an area basis, furthermore, the purchase of these commodities will tend to vary from one community to another. Consumers will be willing to travel greater distances for automobiles than for groceries, and greater distances for hospital services than for the services of primary care physicians. Because the range of commodities sold will vary from community to community, it is possible to infer from the hierarchical structure of the commodities, a corresponding hierarchical structure of communities, trade services, and health service areas.

Seventy-four economic variables were identified in the study and used subsequently to delineate a hierarchical economic system for a part of the intermountain region characterized by rural conditions and low population density. The same geographical region was also used to delineate the health-care delivery system with twenty-four variables.[4/] The two systems, economic and health-care delivery, were delineated with a computer programming methodology that permitted the grouping of 538 communities into seven different groups, each composed of the most similar communities.[5/]

The methodology above was developed on the basis of individual communities rather than individual counties, which are often used in this type of analysis. The emphasis on communities seemed well-founded for a study of the intermountain region because counties in such areas tend to be large and distances between

---

4/ For example, some of the 74 economic variables used in the study were newspaper publishing, petroleum refining, and meat-packing establishments, as well as a large number of different wholesale and retail trade businesses. The 24 health variables largely consisted of counts of various health disciplines, as well as varied characteristics of health institutions and hospital facilities.

5/ The hierarchical structure of central places in the study region, in terms of the economic system, consisted of the following seven groups: (a) Regional trade centers (Denver); (b) Sub-regional trade centers (Salt Lake City); (c) Wholesale-retail centers (3 cities); (d) Primary shopping centers (8 cities); (e) Secondary shopping centers (21 cities); (f) Convenience centers (59 cities); and (g) Minimum convenience centers and hamlets (445 cities). Similar groupings, also in a hierarchical framework, were developed for the health system.

individual communities are often correspondingly large. However, given the low population density of the region under analysis, countless problems were uncovered by the Wyoming study in finding data for both the economic and health systems at the sub-county level. Nevertheless, the data used are similar to the data used for studies in other regions (e.g. Minnesota and Saskatchewan) and yielded results (see below) that were consistent with the expectations of observers familiar with the intermountain region.

Major Hypotheses and Findings

In the Wyoming study, it was found analytically feasible to identify a very close relationship between the economic and health-care systems within the intermountain region. Despite the success of this part of the study, however, the authors were not able to test the hypothesis that the health manpower education system is functionally dependent on or related to either the health-care delivery system or the economic system. The major conclusions of the study can be summarized by discussing the major hypotheses tested.

(A) There are statistically significant similarities between the hierarchical structures of the economic and health-care delivery systems. To test this hypothesis, a methodology was developed as indicated above, which was comprised of a "centrality index" as the measure of the economic importance of a central place, and of a heuristic programming algorithm which served the purpose of efficiently forming hierarchical groups of central places based upon their centrality index scores.[6/] Two hierarchies were formed in the study area--one based on economic characteristics and the other based on health delivery characteristics.

6/ The centrality index, as an indicator for the economic system, measures the intensity of economic activity from one community to another, as well as the extent to which more specialized economic activities fall within communities. The same index would be transferable to characterizing the health-care delivery system--for example, the extent to which secondary and tertiary medical specialty services are available.

Statistical tests comparing the two hierarchies were performed by comparing the rankings of central places in the health and economic hierarchies. Spearman's rank correlation coefficient and Kendall's rank correlation coefficient indicated highly significant similarities between the two rankings. Parametric tests were also performed by assuming that the health index values for communities were a function of the economic index values. A regression equation was estimated and the parametric values were shown to be highly significant.

It was suggested in the study, however, that the statistical tests undertaken may have masked some important additional comparisons between the economic and health systems. The observation was made, for example, that the health-care delivery system seems to be less developed than the economic system. There were fewer communities in the top five hierarchical groups of the health system as compared to the economic system. This meant that there was a tendency for communities to fall into a lower health group than economic group.

(B) Hierarchical service areas are preferable to political units (e.g. counties) and other popular area designations as units for health planning. A review of the methodologies employed in the formation of Rand McNally trade areas, Bureau of Economic Analysis Economic Areas, and Functional Economic Areas was included in the Wyoming study, as well as a summary of other methods which have appeared in the literature. It was pointed out in the study that these methodologies generally have distinct weaknesses for planning purposes--that the hierarchical notion has often been omitted from the methods employed; that inappropriate data have been employed to reflect rural economic activity; and that political boundaries have often been assumed to equal economic boundaries with no justifying arguments presented.

The authors indicated two particular advantages to the methodology of formulating services areas used in this study. First, the methodology was found

to be specifically relevant for studying rural regions since it accounts for quite small communities (e.g. less than 4,000 population in the Wyoming study). Second, given the incorporation of the concept of hierarchies, the authors found it possible to utilize service areas in the planning of a wide range of health activities--from the very basic services requiring small service areas, to the sophisticated facilities and manpower serving very large areas.

(C) It is possible to make inferences about health services which a community and its market area population can support by noting the number and types of business establishments located in the area. This hypothesis was not fully validated, but further procedures which might be followed in proving the hypothesis were suggested by the authors. Characteristics of communities in each group were described for both the economic and the health service hierarchies. Propositions from central place theory were derived and applied to the hierarchies to define intergroup marginal economic activities (IMEA's) and intergroup marginal health activities (IMHA's).7/

The propositions developed were then used to derive specific empirical rules which were operational in determining IMEA's and IMHA's for the study region. However, since no attempt was undertaken in the Wyoming study to relate the IMEA's and IMHA's, the study did not specifically indicate how knowledge about health services can be gained by counting business establishments.

7/ The economic or health activities added or subtracted due to inter-group movement of cities are defined by the authors as inter-group marginal activites. For example, given the occurrence of new industrial plants or new hospital facilities, if a central place should move upward from its original group to another, than it would be expected that one or more highly-order (i.e. more specialized) activities would be added to the original intra-group nucleus, and that there would be an increase in the number of activities in the original set of intra-group activities.

While specific rules of thumb were not provided for equating economic activities and health activities, there were broad planning implications identified in the study arising from the relationship of the two hierarchies. If changes in the economic hierarchy could be anticipated or forecasted by planners, then knowledge of the previous health system would give indications of what health activities could be supported by specific communities after the economic change occurred.

(D) The hierarchical nature of the economic system can serve as an efficient base for locating health manpower education programs. Largely based on limited availability of data, the research efforts designed to estimate the interrelationships of the health manpower education system with the economic and health-care delivery systems were inconclusive. Part of the difficulty in identifying the health manpower education system, as presented in the study, is the fact that schools of health manpower education tend to be located on the basis of political considerations rather than upon pure allocative considerations.

Apart from this consideration, however, the authors highlighted constraints upon empirical analysis posed by gaps in key data elements. First, the authors found a dearth of information on the students in the study region and the places of employment after graduation. The data problems were further compounded by the fact that there exists virtually no meaningful information on the optimal size range of individual health manpower education programs. As such, the authors report, in view of the lack of fundamental information on the nature of health manpower education programs, the research must necessarily be relatively speculative and subjective in this area.

The University of Wyoming study, in conclusion, strongly recommended that additional research be conducted in three areas before it would be possible to relate the economic and health-care delivery systems to the health manpower education

system: (1) determination of the distances that students will travel for attending individual health manpower education programs; (2) determination of the distance that students will consider in accepting employment after graduation; and (3) the determination of the optimal size range for individual health manpower education programs.

Policy Implications of Wyoming Study

The conclusions of this study of the economic system, the health-care delivery system, and the health manpower education system may potentially alter present research approaches to health manpower education and present health manpower education policy. In this chapter, possible implications for both research and policy are offered.

A. Health-Care in Some Community

To conduct consumer surveys to determine the range of economic and health-care activities used by residents in a community is feasible. However, a reasonable expectation is that a survey of the range of the activities offered in the community would yield similar information. Therefore, if all residents purchase refrigerators and dental services, the inference is that (a) if refrigerators and dental services are available in some community then some people may buy in the community, and some may buy elsewhere; and (b) if neither refrigerators nor dental services are available in the community, then the residents must buy elsewhere. Conducting a survey of consumer purchase patterns for refrigerators and dental services produces more information; however, the added information may not compensate for the extra cost.

The determination that (a) communities can be ordered, and (b) activities (both economic and health-care) can be ordered in a system consistent with central place theory has been established in this study. Inter-group marginal activities for a rural, low population density region have been identified.

The empirical results have indicated that the presence of some activity within the community is not totally related to the demand for that activity within the community--that communities can support a greater range and magnitude of activities when the notion of population is broadened to include the hinterland population as well as the indigenous community population. The concept of a Standard Metropolitan Statistical Area incorporates a similar notion by inferring that the population of some city exceeds the physical boundaries of that city and includes the peripheral population in the suburbs. In this study, the inference is that residents outside the corporate limits of some community may be as much an integral part of the community as those within the community even though the rural residents are not part of any incorporated place, per se. Identification of the exact size of the population that might be added to the indigenous population of the community is not feasible. However, a reasonable expectation is that if the indigenous populations of Communities A and B are, respectively, 4,000 and 10,000; and if the level of economic activity and the level of health-care activity are the same for both of these communities; then the total population served by these communities must be approximately the same.

Furthermore, if some order of physician services is available in a community, then the demand for that service is high enough (from both residents and non-residents) to warrant the provision of that order of physician services. Therefore, the presence or absence of some economic or health activity in a community provides indirect evidence about demand: if demand is high enough, the activity is present. Thus, the presence or absence of activities is a surrogate for household surveys of demand whether the survey is for the economic system or for the health-care delivery system.

For the smallest communities, where there are no hospital and no physician, health-care might be viewed in the context of need rather than in the context of

demand. To determine health-care needs in the smallest communities, the authors suggest that formal surveys of consumers appear to be necessary.[8/] Since no survey work was conducted in the Wyoming study, as stated in the contract specifications, no information is available in quantifiable form. Nevertheless, the research effort did involve the assistance of many different individuals in the seven States. These individuals represent, in varying ways, resource persons providing qualitative information about the rural health-care system.

Smaller communities have various kinds of health manpower assisting in the treatment of illnesses and injuries. Some communities have chiropractors and some veterinarians. Others may have an RN or LPN living in the community. These kinds of manpower are utilized by rural residents to provide a variety of diagnostic treatment for illnesses and injuries. These qualitative data suggest that a referral system operates from small communities to larger communities via this informal health-care delivery system.

Research into the specific nature of the health-care delivery system should have potential value for planning. If, for example, allied health manpower and self-diagnosis are widely used in small communities, then non-physician manpower may be widely acceptable there. Research of this nature requires a survey to determine where rural residents enter the health-care system for diagnosis and treatment, since secondary data do not permit a definitive method for identifying the methods of diagnosis and treatment in rural areas.

B. Dynamic Models or Static Models

The empirical models of the economic and health-care delivery systems in the Wyoming report were derived from cross-sectional data. Thus, these models are static in nature. To have made the models dynamic across time periods, it would

---

8/ The delineations of both the economic and health-care delivery systems, as developed in the study, were based on demand rather than upon need. No attempt was made, consequently, to determine the level of services needed by rural residents.

have been necessary to develop time-series data.

In a more narrow sense, however, these models do have dynamic implications. For example, if rural development should occur, then at least one community will grow in size as a result of the development. If that community acquires higher-order economic activities, higher-order health facilities, and higher-order health manpower, then movement might occur between groups in the hierarchical system. The total number and types of activities will change for the region, thus changing the relative influence of each community in the region. To simply compare the change in one community with the rest of the system without re-submitting the whole region to the hierarchical methodology would not be consistent.

If, however, it is known that economic development will occur in some rural area, and if information is available on the size of the development, then inferences can be made about the configuration of the economic and health-care systems that will evolve. Such inferences about the future configuration of communities following development would have good potential for both health and health manpower planners. On the basis of the estimates of the future health-care delivery system, inferences could be made concerning the hospital facilities required, and the quantity and kinds of health manpower needed for employment in the community. Further, planners should be able to estimate changes in the health manpower education system required to alter the supply of health manpower for the given rural development. In this sense, the empirical models provide information about inter-group movement and have some dynamic implications for health and health manpower planning.

C. Transferability to other Regions

The economic and health-care delivery system models developed in this study were based on data collected in a region of mountains, high plains, and low population density. Are these models transferable to other regions with different characteristics--non-mountainous or high population density regions?

A definitive answer to this question is difficult. Nevertheless, there are several important considerations in answering it. First, the consumption pattern of the residents of the intermountain region is expected by the authors to parallel the consumption patterns of residents in other parts of the United States due to the influence of the communications system and the advertising system. The stimuli for consumption spending in the urban Northeast are similar to those in the rural intermountain region. Thus, the number and range of businesses in the economic system required to support some population size (both indigenous and hinterlands) are similar for a low density area and a high density area. More specifically, if Community A in southern Montana has some given range of businesses and serves a total population of X; then some Community B in New York, serving a population of size X, would have almost the same number and range of businesses.

Second, the question might be posed: "Given the low population density of the intermountain region, will the larger distances between communities in the intermountain region restrict the transferability of these results?" The answer to this question is subjective and must be so qualified. Nevertheless, if a household is located 50 miles from the nearest community in the intermountain region as compared to a household located 10 miles away in some other region, each householder travels a minimum distance of 50 and 10 miles respectively to the nearest trade center. If members of these two households require highly specialized medical services, and the householder in the study region would travel 400 miles and the one in the high density population region would travel 20 miles, then the travel distance becomes relative. It seems untenable to maintain, for example, that if residents of urban regions refuse to travel more than 25 miles for some services (assuming the service is available within a 25-mile radius), then a rural resident in a low population density region is unwilling to travel more than 25 miles for the same service. The minimum distance travelled for any commodity would then be determined by the nearest location where that commodity is available. Thus,

although the distance scale may be different in urban regions than in rural regions, the empirical models developed in this study are believed to be transferable from the low population density, intermountain region to high population density, urban areas of the United States.

The authors would expect the results to be transferable to other rural areas. Certainly, the eastern part of the study region (eastern Colorado, western Nebraska, and western South Dakota) is similar to many rural parts of the United States (many small rural communities that are spaced at regular intervals). Since these rural areas fit the general pattern observed in the more mountainous areas, it would seem reasonable to expect that the results of this study region would be transferable to the rural areas.

Two conclusions have been reached: (a) the methodology is transferable to other regions, and (b) the information learned about inter-group marginal economic activities and inter-group marginal health-care activities is transferable to other non-rural areas of the United States. Since the second conclusion requires empirical demonstration for support, there remains the possibility that it could be refuted empirically. Therefore, the authors propose that a similar study be conducted in an urban region of the United States for the purpose of identifying inter-group marginal economic and health activities, and for the purpose of further testing the hypothesis that the economic system can be used as a surrogate for the health-care delivery system. Further evidence confirming the interrelationship of these systems would justify the development of operational models using economic data as a tool for both health planning and health manpower planning.

D. Health Planning and the Economic System

Changes in economic activity result from exogenous changes in the system of production, distribution, and consumption. If exogenous changes can be identified in the system of production, distribution, and consumption, then inferences can be

made in the economic system and the health-care delivery system. For example, if a mine, factory, or similar facility is planned for a rural area, and an estimate can be made of the potential employment impact in the community, then, inferences can be made about the change in the order and magnitude of the economic system and the health system and the configuration of the new health-care delivery system can be estimated by applying the IMEA and IMHA analyses.[9/] Thus, health planners can utilize the information on exogenous change in a regional economic system to estimate the change in the health system.

Planners may have to consider alterations in the existing programs of health manpower education if an increase in the number and order of health manpower in the community is needed. Further, health planners would be able to estimate the configuration of health facilities required in the community and to propose methods of developing the health facilities and health manpower in advance of the change.

If it appears necessary to increase the range and magnitude of present health manpower education programs, then the economic system, as defined by the authors, is useful for identifying some alternatives. The evidence reported in the study indicates that graduates of health manpower education programs locate in the State in which they have received their education. To attract needed manpower, a State experiencing or expecting changes in production, distribution, and consumption might initiate changes in its education programs.

9/ Some efforts were undertaken in the Wyoming study to develop an operational method for utilizing the economic system as a surrogate for the health care delivery system. The results, as reported by the authors, were encouraging, but time and available manpower did not allow an adequate investigation. As such, the preliminary results were considered too tentative to merit inclusion in the final report of the study.

Further, the study continues, if the emphasis for the development of new or larger health manpower education programs could be influenced by federal decision-makers, then interstate program choices might be more efficient. For example, to serve the health-care needs of the assumed population increase for northeast Wyoming, development of new or larger health manpower education programs in communities such as Rapid City, South Dakota; Billings, Montana; Casper, Wyoming; or Sheridan, Wyoming; could be appropriate. That is, the number of alternatives can be increased and greater attention devoted to efficiency in this way, rather than if decisions to develop health manpower education programs are narrowly restricted to intrastate considerations only.

In sum, the potential for using the economic system as a method for improving the quality of health planning, health manpower planning, and health manpower program and facility planning is suggested by this study. Strong indications are that further research into the operational interrelationships of the economic and health-care systems could prove to be of significant value to planners.

E. Data Needs

Numerous references are made in the Wyoming study to the difficulties encountered in finding the appropriate data. Given this problem, it would seem necessary to identify the essential data needed to permit the update (possibly every 10 years) of the economic system and health-care delivery system for the intermountain region.

The essential information needed for delineating the economic system would include data on the number of businesses and dollar value of retail sales volume by four-digit SIC codes. Since this would pose nondisclosure problems in small communities, it is probable that similar work could be restricted to "number of establishments." In this respect, it would be much easier to conduct such a study if the several censuses of retail trade, wholesale trade, and selected services

would include information on all communities. If rural areas continue to experience a shortage or absence of health services, data on these communities should be made available, permitting a more analytical and meaningful analysis of the specific health needs of these areas.

The essential data needs for identifying the health-care delivery system could be met with the compilation of more detailed data on health occupations, and more extensive data on hospitals, including types of hospital employees, costs, and patient characteristics. Also, survey information would be beneficial on the travel patterns of consumers utilizing the health-care delivery system.

Two data requirements for identifying the health manpower education system are the place of residence of students prior to enrollment and residence and employment status of graduates. Additional information would be useful regarding the optimal program size and the cost structure of various sizes and types of programs.

And, finally, to test the hypothesis that consumers follow similar travel patterns to purchase health and non-health services would require a detailed investigation of the trips taken by consumers. A Wyoming transportation study was being conducted at the same time as this study. Unfortunately, the transportation study did not meet the needs of this analysis since the former sought information on transportation patterns within Wyoming and excluded information on origins and destinations outside Wyoming. Nevertheless, these kinds of data would seem important and useful for delineating the service areas for both the health system and the economic system.

F. Conclusion

Although this study did not involve the estimating of health needs and the use of time-series data, the empirical results indicated (a) that the methodology provided meaningful models of the economic and health systems in the intermountain region; (b) that the economic system data are easier to obtain than the health-care

system data; and (c) that given the close relationship of the two systems, the economic system has the potential of being a surrogate for the health-care delivery system.

In view of the limited nature of the study, namely a low population density study region, it may be advisable to apply the methodology in a more densely populated region. Offered in this study are several approaches to the problems of cross-sectional data and transferability that may make further research effort less important and unnecessary.

A well-organized and informal health-care delivery system (not physician and hospital oriented) may exist in many small and rural places in the intermountain region. If such is the case, then rural and small community residents (1,000 persons and below) may be more receptive to primary health care by allied health manpower.

ECONOMIC
BIBLIOGRAPHY

Baker, A. S.; Bishop, F. M.; Hassinger, E. W.; and Hobbs, D. J. "Distribution of Health Services in Missouri: III. Medical Service Centers." Missouri Medicine (January, 1968), 481-497.

Berry, Brian J. L. "An Inductive Approach to the Regionalization of Economic Development." Essays on Geography and Economic Development. Department of Geography Research Paper No. 62. Edited by Norton S. Ginsburg. Chicago: University of Chicago Press, 1960.

Berry, Brian J. L. "The Mathematics of Economic Regionalization." Economic Regionalization. Proceedings of the Fourth General Meeting of the Commission on Methods of Economic Regionalization of the International Geographical Union (September 7-12, 1965 in Brno, Czechoslovakia). Edited by Miroslov Macka. Geographia Polonia, (1967a), 77-106.

Berry, Brian J. L. Geography of Market Centers and Retail Distribution. Foundations of Economic Geography Series. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967b.

Berry, Brian J. L. "Grouping and Regionalizing: An Approach to the Problem Using Multivariate Analysis." Quantitative Geography, Part I: Economic and Cultural Topics. Northwestern University Studies in Geography No. 13. Evanston, Illinois: Department of Geography, Northwestern University, 1967c.

Berry, Brian J. L.; Barnum, H. Gardiner; and Tennant, Robert J. "Retail Location and Consumer Behavior." Regional Science Association, Papers and Proceedings, 9 (1962), 65-106.

Berry, Brian J. L., and Garrison, William L. "The Functional Bases of the Central Place Hierarchy." Economic Geography, 34 (1958), 145-154.

Berry, Brian J. L., and Garrison, William L. "Recent Development of Central Place Theory." Regional Science Association, Papers and Proceedings, 4 (1958), 107-120. Reprinted in Urban Economics: Theory, Development and Planning. Edited by William H. Leahy, David L. McKee, and Robert D. Dean. New York: The Free Press, 1970, 117-128.

Berry, Brian J. L., and Harris, Chauncy D. "Central Places." International Encyclopedia of the Social Sciences. Vol. 2, edited by David L. Sills. New York: The Macmillan Co. and The Free Press, 1968, 365-370.

Berry, Brian J. L., and Marble, D. F., eds. Spatial Analysis. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968.

Bogue, Donald J., and Beale, Calvin L. Economic Areas of the United States. New York: The Free Press of Glencoe, Inc., 1961.

Borchert, John R., and Adams, Russell B. Trade Centers and Trade Areas of the Upper Midwest. Urban Report No. 3. Minneapolis, Minnesota: Upper Midwest Research and Development Council, 1963.

Bracey, H. E. "Towns as Rural Service Centers: An Index of Centrality With Special Reference to Somerset." Institute of British Geographers, Transaction, 19 (1953), 95-105.

Brown, Lawrence A., and Holmes, John. "The Delineation of Functional Regions, Nodal Regions, and Hierarchies by Functional Distance Approaches." Journal of Regional Science, 11 (April, 1971), 57-72.

Brush, John E. "The Hierarchy of Central Places in Southwestern Wisconsin." Geographical Review, 43 (1953), 380-402.

Carol, Hans. "The Hierarchy of Central Functions Within the City." Annals of the Association of American Geographers, 50 (December, 1950), 419-438.

Carrothers, Gerald A. P. "An Historical Review of the Gravity and Potential Concepts of Human Interaction." Journal of the American Institute of Planners, 22 (Winter, 1956), 94-102.

Christaller, Walter. The Central Places of Southern Germany. Translated by C. W. Baskin. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966.

Clark, Phillip J., and Evans, Francis C. "Distance to Nearest Neighbor as a Measure of Spatial Relationships in Population." Ecology, 35 (1954), 445-453.

Converse, P. D. Retail Trade Areas in Illinois. Bureau of Economic and Business Research, Business Studies, No. 4, 1946. University of Illinois, Urbana.

Converse, P. D. A Study of Retail Trade Areas in East Central Illinois. Bureau of Economic and Business Research, Business Studies, No. 2, 1943. University of Illinois, Urbana.

Davies, Wayne K. "Centrality and the Central Place Hierarchy." Urban Studies, 4 (1967), 61-79.

Dawson, J. H. "Retail Structure in Groups of Towns." Regional and Urban Economics, 2 (May, 1972), 25-65.

Dickinson, Frank G. Distribution of Physicians by Medical Service Areas. American Medical Association Bureau of Medical Economic Research Bulletin, 94 (1954).

Douglas, Edna. "Measuring the General Retail Trading Area--A Case Study: I." The Journal of Marketing, 13 (April, 1949), 481-497.

Douglas, Edna. "Measuring the General Retail Trading Area--A Case Study: II." The Journal of Marketing, 14 (July, 1949), 46-60.

Doxiades, Konstantinos A. Ekistics: An Introduction to the Science of Human Settlements. New York: Oxford University Press, 1968.

Duncan, J. S. "New Zealand Towns as Service Centers." New Zealand Geographer, 11 (1955), 119-138.

Dun and Bradstreet. Reference Book: March, 1972. New York: Dun and Bradstreet, 1972.

Fisher, W. F. "On Grouping for Maximum Homogeneity." Journal of the American Statistical Association, 53 (1958), 789-798.

Fox, Karl A. "Functional Economic Areas A Strategic Concept for Promoting Civic Responsibility, Human Dignity and Maximum Employment in the United States." Iowa State University, Ames, Iowa, January 10, 1969. (Mimeographed.)

Fox, Karl A. "The New Synthesis of Rural and Urban Society in the United States." Paper prepared for the Conference on the Economic Problems of Agriculture, International Economic Association, Rome, Italy, Sept. 1-8, 1965a.

Fox, Karl A., and Kumar, T. Krishna. "The Functional Economic Area: Delineation and Implications for Economic Analysis and Policy." The Regional Science Association, Papers and Proceedings, 15 (1965b), 57-85.

Fruchter, B. Introduction to Factor Analysis. New York: D. Van Nostrand Company, Inc., 1954.

Haggett, Peter. Locational Analysis in Human Geography. New York: St. Martins Press, 1966.

Hall, W. W., Jr., and Hite, J. C. "The Use of Central Place Theory and Gravity-Flow Analysis to Delineate Economic Areas." Southern Journal of Agricultural Economics, (December, 1970), 147-153.

Harris, Chauncy D. "Methods of Economic Regionalization." Geographia Polonica, 4 (1964), 59-86.

Harris, Chauncy D., and Ullman, Edward L. "The Nature of Cities." Annals of the American Academy of Political and Social Science, 242 (1945), 7-17.

Hodge, Gerald. "The Prediction of Trade Center Viability in the Great Plains." Regional Science Association, Papers and Proceedings, 15 (1965), 87-115.

Horton, Frank E., and McConnell, Harold. "A Method for Classification and Regionalization Based on Areal Association." The Annals of Regional Science, 3 (December, 1966), 111-126.

Isard, Walter. Methods of Regional Analysis: An Introduction to Regional Science. New York: John Wiley and Sons, Inc., 1960.

Johnson, Lane J. "Centrality Within a Metropolis." Economic Geography, 40 (October, 1964) 324-326.

Johnson, Lane J. "The Spatial Uniformity of a Central Place Distribution in New England." Economic Geography, 47 (April, 1971), 156-170.

Kaufman, Harold F. "Procedures Used in the Preparation of a Medical Service Area Map for North Carolina." Rural Sociology, 17 (December, 1952), 367-371.

Lewinski, Stanislaw. "Taxonomic Methods in Regional Studies." Economic Regionalization and Numerical Methods. Final Report of the Commission on Methods of Economic Regionalization of the International Geographical Union. Edited by B. J. L. Berry and Adrzej Wrobel. Geographia Polonia, 15 (1968), 189-198.

Losch, August. The Economics of Location. Translated by W. H. Woglom and W. F. Stolper. New Haven, Connecticut: Yale University, 1954.

Marble, Duane F. Some Computer Programs for Geographic Research. Evanston, Illinois: Department of Geography, Northwestern University, 1967.

Marshall, John U. The Location of Service Towns: An Approach to the Analysis of Central Place Systems. Toronto, Canada: University of Toronto Press, 1969.

Mayfield, Robert C. "A Central Place Hierarchy in Northern India." Quantitative Geography. Part I: Economic and Cultural Topics. Northwestern University Studies in Geography No. 13. Evanston, Illinois: Department of Geography, Northwestern University, 1967.

Moran, P. A. P. "The Interpretation of Statistical Maps." Journal of the Royal Statistical Society, Series B, 10 (1948), 245-251.

Nixon, Richard M., President of the United States. Weekly Compilation of Presidential Papers. February 22, 1971, Vol. 8, No. 8, 245.

Nourse, Hugh O. Regional Economics. New York: McGraw-Hill Book Company, 1968.

Nystuen, John D., and Dacey, Michael F. "A Graph Theory Interpretation of Nodal Regions." Regional Science Association, Papers and Proceedings, 7 (1961).

Park, Robert E. "Urbanization as Measured by Newspaper Circulation." American Journal of Sociology, 35 (1929), 60-79.

Park, Robert E., and Newcomb, Charles. "Newspaper Circulation and Metropolitan Regions." The Metropolitan Community. Edited by Roderick D. McKenzie. New York: Russell and Russell, 1933, 98-110.

Philbrick, Allen K. "Areal Functional Organization in Regional Geography." Regional Science Association, Papers and Proceedings, 3 (1957), 87-98.

Preston, Richard E. "The Structure of Central Place Systems." Economic Geography, 47 (April, 1971), 136-153.

Rand McNally and Company. Commercial Atlas and Marketing Guide. Chicago, Illinois: Rand McNally and Company, 1972.

Reilly, William J. "The Methods for the Study of Retail Relationships." University of Texas Bulletin, 2944 (November, 1929).

Reilly, William J. The Law of Retail Gravitation. New York: By the author, 1931.

Richardson, Henry W. Regional Economics. New York: Praeger Publishers, 1969.

Rutherford, John; Locan, M. I.; and Missen, G. J. New Viewpoints in Economic Geography. West Como, New South Wales, Australia: Martindale Press, 1966.

Schwartz, George. Development of Marketing Theory. Cincinnati: Southwestern Publishing Company, 1963.

Scott, Allen J. Combinatorial Programming, Spatial Analysis and Planning. London: Methuen and Company, Ltd., 1971.

Scott, Allen J. "Location-Allocation Systems: A Review." Geographical Analysis, 2 (1970), 95-119.

Smailes, Arthur E. "The Urban Hierarchy in England and Wales." Geography, 29 (1944), 41-51.

Taaffe, Edward J. "The Urban Hierarchy: An Air Passenger Definition." Economic Geography, 38 (January, 1962), 1-14.

Taliaferro, J. Dale, and Remmers, W. W. "Identifying Integrated Regions for Health Care Delivery." Health Service Reports, 88 (April, 1973), 337-343.

Taliaferro, J. Dale, and Remmers, W. W. Draft of descriptive material pertaining to the delineation of Bureau of Economic Analysis Economic Areas. July, 1972.

Thompson, H. R. "Distribution of Distance to nth Neighbor in a Population of Randomly Distributed Individuals." Ecology, 37 (April, 1956), 391-394.

Thompson, John H.; Sufrin, Sidney C.; Gould, Peter R.; and Buck, Marion A. "Toward a Geography of Economic Health: The Case of New York." Annals of the Association of American Geographers, 52 (March, 1962), 1-20.

Department of Transportation. Federal Aviation Administration. Civil Aeronautics Board. Airport Activity Statistics of Certified Route Air Carriers. June 30, 1970.

United States Bureau of the Census. Metropolitan Area Definition: A Re-Evaluation of Concept and Statistical Practice. Revised by B. J. L. Berry with P. G. Goheen and H. Goldstein. Bureau of the Census Working Paper No. 28, Washington, D.C., July, 1969.

United States Bureau of the Census, Statistical Abstract of the United States: 1972. Washington, D.C.: Government Printing Office, 1972.

United States Department of Commerce. Regional Economics Division. Office of Business Economics. "OBE Economic Areas of the United States," September, 1967. (Mimeographed.)

United States Postal Service. Bureau of Finance and Administration. Revenues and Classes of Post Offices. Publication No. 4, July 1, 1971.

Vining, Rutledge. "Delimitation of Economic Areas: Statistical Concepts in the Study of Spatial Structure of an Economic System." Journal of the American Statistical Association, (March, 1953).

Ward, Joe, Jr. "Hierarchical Grouping to Optimize An Objective Function." Journal of the American Statistical Association, 58 (1963), 236-244.

Wold, John S. "Impact on the Environment of Coal Mining in Wyoming." A paper presented to the Geological Society of America, Rocky Mountain Section, May 11, 1972. (Mimeographed.)

Woldenberg, Michael J. "Energy Flow and Spatial Order: Mixed Hexagonal Hierarchies of Central Places." Geographical Review, 58, (October, 1968), 552-574.

Wrobel, Adrzej. "Perspectives and Limitations of the Applications of Mathematical Methods in Economic Regionalization." Economic Regionalization. Proceedings of the 4th General Meeting of the Commission on Methods of Economic Regionalization of the International Geographical Union (September 7-12, 1965 in Brno, Czechoslovakia). Edited by Miroslov Macka. Geographia Polonia, (1967), 123-127.

HEALTH
BIBLIOGRAPHY

American Dental Association. American Dental Association Catalog, 1972. Chicago, Illinois: American Dental Association, 1972.

American Dental Association. Annual Report of Dental Education, 1971-72. Chicago, Illinois: American Dental Association, 1972.

American Dental Association. American Dental Association Directory. Chicago, Illinois: American Dental Association, 1972.

American Dental Association. Annual Report of Dental Education, 1971-72. Chicago, Illinois: American Dental Association, 1972.

American Dental Association, Division of Educational Measurements, Annual Report on Dental Auxiliary Education, 1970-71. Chicago, Illinois: American Dental Association, 1971.

American Hospital Association. Journal of AHA Guide Issue. Chicago, Illinois: American Hospital Association, 1970.

American Hospital Association. Journal of AHA Guide Issue. Chicago, Illinois: American Hospital Association, 1971.

American Hospital Association. Journal of AHA Guide Issue. Chicago, Illinois: American Hospital Association, 1972.

American Medical Association. Allied Medical Education Directory 1972. Chicago, Illinois: American Medical Association, 1972.

American Medical Association. American Medical Association Directory. Chicago, Illinois: American Medical Association, 1969.

American Medical Association. A Report on Health Care of the Poor. Chicago, Illinois: American Medical Association, 1969.

American Medical Association, Department of Health Manpower, and the Division of Manpower Intelligence. Summary of Training Programs: Physician Support Personnel. Washington, D.C.: Government Printing Office, 1973.

American Medical Association, Department of Survey Research. Distribution of Physicians, Hospitals, and Hospital Beds in the United States: 1969. Vol. 1. Chicago, Illinois: American Medical Association, 1969.

American Medical Association, Department of Survey Research. Distribution of Physicians, Hospitals, and Hospital Beds in the United States: 1969. Vol. 2. Chicago, Illinois: American Medical Association, 1969.

Andersen, Ronald. A Behavior Model of Families' Use of Health Services. Chicago, Illinois: Center for Health Administration Studies, Research Series 25, 1968.

Arrow, K. J., "Uncertainty and the Welfare Economics of Medical Care." American Economic Review (1963), 941-951.

Arrow, K. J., and Capron. W. M. "Dynamic Shortages on Price Rises: The Engineer-Scientist Case." Quarterly Journal of Economics, 3 (1959), 292-308.

Bailey, N. J., "Queuing for Medical Care." Applied Statistics (1954), 137.

Becker, Cary S. Human Capital. New York: National Bureaus of Economic Research, 1964.

Blum, H. L., and Associates. Health Planning. Berkeley, California: University of California, 1969.

Bridgman, R. F. "Some Methodologic Problems in Health Practice Research and Health Planning," International Journal of Health Services, 2, Number 1, 1972, 51-61.

Colorado Department of Health. Colorado State Plan for Construction of Hospitals and Health Facilities. Denver, Colorado, 1971.

Colorado Department of Health. Directory of Colorado Health Facilities. Denver, Colorado, 1972.

Davies, J. O., Towards a Measure of Medical Care: Operational Research in the Health Services. London, England: Oxford Press, 1962.

Department of Health, Education, and Welfare, and American Association of Junior Colleges. Allied Health Education Programs in Junior Colleges, 1970. Washington, D.C.: Government Printing Office, 1972.

Department of Health, Education, and Welfare, and Association of Schools of Allied Health Professions. Allied Health Education Programs in Senior Colleges, 1971. Washington, D.C.: Government Printing Office, 1973.

Dunaye, Thomas M. "Community Planning for New Partnerships in Health Administration," American Journal of Public Health, 60, June 1970, 987-994.

Eastern Montana Community Health Association. Illness and Medical Care in Eastern Montana. Missoula, Montana: Institute of Social Science Research, 1971.

Farrell, M. J., "The Measure of Productive Efficiency." Journal of Royal Statistical Society, Series A (1957), 253.

Feldstein, Martin S. "Hospital Bed Scarcity: An Analysis of the Effects of Inter-Regional Differences," Economica, 32, November 1965, 393-409.

Fuchs, Victor R. Essays in Economics of Health and Medical Care. New York: Columbia University Press, 1972.

Gallaway, Lowell E. Manpower Economics. Georgetown, Ontario: Richard D. Irwin, Inc., 1971.

Goodwin, P. H. and J. D. Harvey. "The Intra-Institutional Planning Process," Hospital Administration, 14, Winter 1969, 99-106.

Grossman, Michael. The Demand for Health: A Theoretical and Empirical Investigation. New York: National Bureau of Economic Research, 1972.

Kadish, Joseph and Lang, James W., "The Training of Physician Assistants: Status and Issues." JAMA, 8 (May 11, 1970), 212.

Klarman, Herbert E. The Economics of Health. New York and London: Columbia University Press, 1965.

Klarman, Herbert E. Empirical Studies in Health Economics. Baltimore, Maryland: John Hopkins Press, 1970.

Klarman, Herbert E. Hospital Care in New York City. New York: Columbia University Press, 1963.

Matenson, Sandra. Health Resources in South Central Montana. Boulder, Colorado: Western Interstate Commission for Higher Education, 1972.

McNerney, Walter J. Hospital and Medical Economics. 2 Vols. Chicago, Illinois: Hospital Research and Educational Trust, 1962.

McNerney, Walter J., and Donald C. Riedel. Regionalization and Rural Health Care. Bureau of Hospital Administration. Research Studies No. 2. Ann Arbor, Michigan: University of Michigan, 1962.

Meuller, Heinz F. Colorado Health Consumer Survey, A Regional Analysis. Denver, Colorado: Colorado-Wyoming Regional Medical Program, 1971.

Montana State Department of Health. Division of Hospitals and Medical Facilities. Montana State Plan Hospitals and Medical Facilities Construction. Helena, Montana, 1969-1970.

Mountain States Regional Medical Program. Detailed Characteristics of Registered Nurses and Licensed Practical Nurses in Wyoming. Boulder, Colorado: Western Interstate Commission for Higher Education, 1970.

Mountain States Regional Medical Program. Survey of Consumers of Health Care. Boulder, Colorado: Western Interstate Commission for Higher Education, 1969.

Mountain States Regional Medical Program. Survey on Continuing Education Needs for Health Professionals. Boulder, Colorado: Western Interstate Commission for Higher Education, 1969.

Mountain States Regional Medical Program, Wyoming Division. Survey of Wyoming Medical Record Librarians. Boulder, Colorado, 1968.

Mountain States Regional Medical Program, Idaho Division. Idaho Health Profile. Boulder, Colorado: Western Interstate Commission for Higher Education, 1971.

Mountain States Regional Medical Program, Montana Division. Montana Health Profile. Boulder, Colorado: Western Interstate Commission for Higher Education, 1969.

Mountain States Regional Medical Program, Wyoming Division. Characteristics of Registered Nurses and Licensed Practical Nurses. Boulder, Colorado: Western Interstate Commission for Higher Education, 1970.

Mountain States Regional Medical Program, Wyoming. Survey of Wyoming Ambulance Services. Boulder, Colorado: Western Interstate Commission for Higher Education, 1968.

Mountain States Regional Medical Program, Wyoming Division. Wyoming Health Profile. Boulder, Colorado: Western Interstate Commission for Higher Education, 1969.

Mountain States Regional Medical Program, Wyoming Division. Wyoming Health Profile Updated Supplement. Boulder, Colorado: Western Interstate Commission for Higher Education, 1971.

Mountain States Regional Medical Program, Wyoming Division. Wyoming Health Profile Updated Supplement 2. Boulder, Colorado: Western Interstate Commission for Higher Education, 1972.

National Task Forces Project. Health Manpower, Action to Meet Community Needs. Washington, D.C.: Public Affairs Press, 196767.

Nebraska State Department of Health. Nebraska Medicare-Medicaid Project Team. A Selected Inventory of Services Offered by Nursing Homes In Nebraska. Lincoln, Nebraska, 1972.

Parker, Randolph S., and Olson, Anthony R. Profile of Wyoming Physicians, 1967. Boulder, Colorado: Western Interstate Commission for Higher Education and Mountain States Regional Medical Program, Wyoming Division, 1969.

Perlman, Richard. The Economics of Education: Conceptual Problems and Policy Issues. New York: McGraw-Hill Book Company, 1973. 3.95 P.O.

Powell, Mel D., Bodwitch, William P., Fidelman, Bruce P., Winter, William C. Comprehensive Health Planning, A Manual for Local Officials. Washington, D.C.: National Association of Counties Research Foundation, 1969.

Royce, Paul C. "Can Rural Health Education Centers Influence Physician Distribution?" JAMA, 6 (May 8, 1972), 847-849.

Smith, Lewis H. Economic, Demographic, and Sociological Factors Influencing the Geographic Mobility of Young Workers. University of Mississippi, Center of Manpower Studies, 1972.

University Mass 38677

Smith, Richard A. and Voth, Raymond E. "A Strategy for Health Manpower." JAMA, 10 (September 6, 1971), 1362-1367.

Somers, Anne R. "Goals Into Reality: The Challenge of Health Planning," Hospitals, Journal of American Hospital Association, 43, August 1, 1969, Pt. 1, 41-48.

Somers, Anne R. Health Care in Transition: Directions for the Future. Chicago, Illinois: Hospital Research and Educational Trust, 1971.

Somers, Herman M. "Economic Issues in Health Services." Contemporary Economic Issues. Edited by Neil W. Chamberlain. Homewood, Illinois: Richard D. Irwin, Inc., 1969.

South Dakota Department of Health. Comprehensive Health Planning. Health Facilities and Services in South Dakota. Pierre, South Dakota, 1972.

South Dakota Department of Health. Regional Medical Program. Comprehensive Health Planning. Directory of Health Manpower Training Programs in South Dakota, 1972. Boulder, Colorado: Western Interstate Commission for Higher Education, 1971.

Stahl, Sidney M. and Suelman, Mary. Rural Physician Manpower: An Annotated Bibliography. Columbia, Missouri: Studies in Health Care, 1971.

United States Department of Health, Education, and Welfare. The Allied Services Act. Washington, D.C.: Government Printing Office, 1972.

United States Department of Health, Education, and Welfare. Compilation of State Dentist Manpower Reports. Washington, D.C.: Government Printing Office, 1970.

United States Department of Health, Education, and Welfare. Directory of State, Territorial, and Regional Health Authorities, 1971-72. Washington, D.C., 1972.

United States Department of Health, Education, and Welfare. Health Manpower, A County and Metropolitan Area Data Book. Washington, D.C.: Government Printing Office, 1971.

United States Department of Health, Education, and Welfare. Report on Licensure and Related Health Personnel Credentialing. Washington, D.C.: Government Printing Office, 1971.

United States Department of Health, Education, and Welfare. Health Insurance Statistics. Health Insurance for the Aged: Professional and Technical Employers of Participating Health Facilities, July 1969. Washington, D.C.: Government Printing Office, 1971.

United States Department of Health, Education, and Welfare. Department of Manpower Intelligence. American Medical Association. Summary of Training Programs: Physician Support Personnel. Washington, D.C.: Government Printing Office, 1972.

United States Department of Health, Education, and Welfare. Department of Manpower Intelligence Reports. Health Manpower Clearing House Series. Inventory of Federal Programs that Support Health Manpower Training, 1970. Washington, D.C.: Government Printing Office, 1972.

United States Department of Health, Education, and Welfare. National Center for Health Statistics. Health Resources Statistics. Washington, D.C.: Government Printing Office, 1972.

United States Department of Health, Education, and Welfare. Division of Nursing. Planning for Nursing Needs and Resources. Washington, D.C.: Government Printing Office, 1972.

United States Department of Health, Education, and Welfare. Public Health Service. Division of Hospital and Medical Facilities. Hospital Personnel. Washington, D.C.: Government Printing Office, 1966.

University of Montana. Montana State College. System Sciences, Inc. Eastern Montana Health Survey. Bethesda, Maryland: System Sciences, Inc., 1970.

Wisconsin State Employment Service. A Study of Health and Related Service Occupations in Wisconsin, 1964.

Wyoming Commission for Nursing and Nursing Education. Preliminary Report of the Task Force. Cheyenne, Wyoming: Colorado-Wyoming Regional Medical Program, 1973.

Wyoming Department of Health and Social Services. Office of Comprehensive Health Planning and Office of Emergency Medical Services. Wyoming Emergency Medical Services. Cheyenne, Wyoming: State of Wyoming, 1971.

Wyoming Department of Health and Social Services. Division of Health and Medical Services. Medical Facilities Services. Wyoming Hospital and Medicare Facilities Construction Plan. Cheyenne, Wyoming, 1970.

Wyoming Health Association. Resource Directory. Cheyenne, Wyoming: Wyoming Health Association, 1967.

Yett, Donald. "Supply of Nurses: Economists View." Hospital Progress, (February, 1965), 89-92, 94.